AD-A051 799 MCDONNELL AIRCRAFT CO ST LOUIS MO F/G 20/6

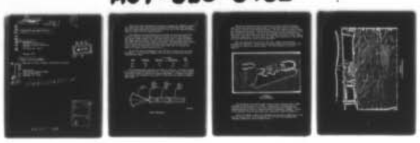
NON-LINEAR LENS MODIFICATION.(U)

FEB 78 G LICIS N60921-77-M-E169

UNCLASSIFIED MC7-313-3452 NL

| OF |

AD A051799



END

DATE FILMED

4 78

DDC

14

Report MC7-313-3452

11 28 Feb[redacted]78

12 4p.

AD A051799

6 NON-LINEAR LENS MODIFICATION,

10 George/Licis
McDonnell Aircraft Co.
McDonnell Douglas Corporation
Box 516
St. Louis, MO 63166

December 1977

9 Final Technical Report.

Approved for public release; distribution unlimited

Prepared for
NAVAL SURFACE WEAPONS CENTER
Dahlgren Laboratory
Dahlgren, VA 22448

15 N60921-77-M-E169

403 111 JOB

This final report documents the results of Contract No. N60921-77-M-E169. The objective of this contract was to evaluate the Non-Linear Lens designed and built under Contract No. N00014-73-C-0154 for use in the terminal guidance phase of electro-optical homing missiles.

The problem with conventional optical systems is that they suffer from a lack of adequate resolution because of the wide field-of-view necessary for initial target acquisition. The wide field of view is required because the target may be off-axis. After initial acquisition, a narrow field-of-view high resolution optical system is required. The Non-Linear Lens combines both of these features, wide field-of-view and high resolution on-axis. A zoom capability was added to the basic Non-Linear Lens to evaluate the effect of a range of wide fields-of-view.

An optical relay was designed to mate the ONR non-linear lens to a GFE CCD Camera. A 3/1 zoom was designed into the relay to yield the following field-of-view range:

ZOOM	DIAGONAL	3 x 4 FORMAT VERTICAL	HORIZONTAL	MIN F/No
Min.	160°	32°	64°	3.8
Max.	12°	5°	6.4°	11.4

The resulting relay components are shown in Figure 1. Zoom was adjusted by an easily accessible manual control. Provisions were made to vary on-axis focus from 10 feet to infinity by a manual adjustment. A manually adjustable iris control was provided so that depth of field could be traded off against light level.

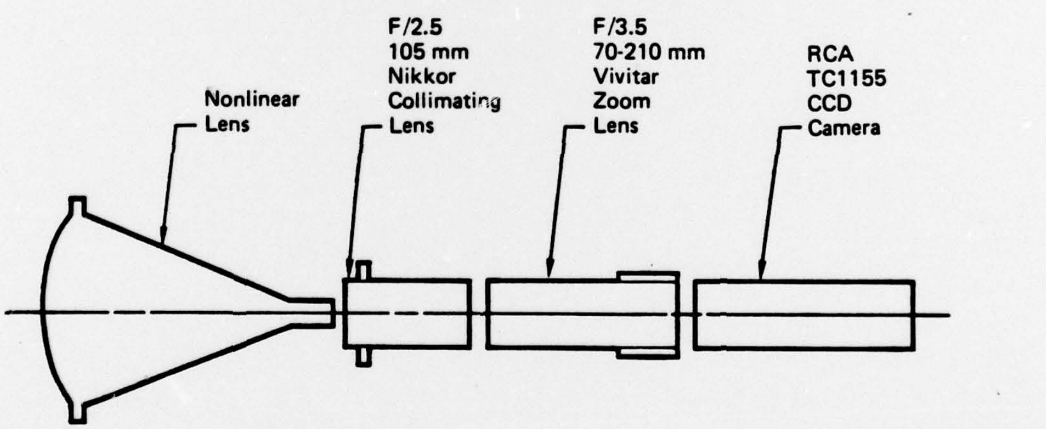


Figure 1 Optical Layout

Laboratory systems tests were performed on an optical bench to assess zoom, focus, and resolution capabilities. During these tests the CCD Camera was found to produce substandard performance. For this reason a vidicon camera was utilized for the tests. Initial tests showed low on-axis performance. This was corrected by installing a new rear spline element in the non-linear lens. After this, the resolution was found to be compatible with the 525 line vidicon resolution capability. The zoom range and light level capability of the systems were then evaluated and found to be as specified.

Next the supporting structure for the lens, camera, and relay were designed and fabricated. A protective shield was added to the non-linear lens to protect it against accidental damage. The final assembly is shown in Figure 2.

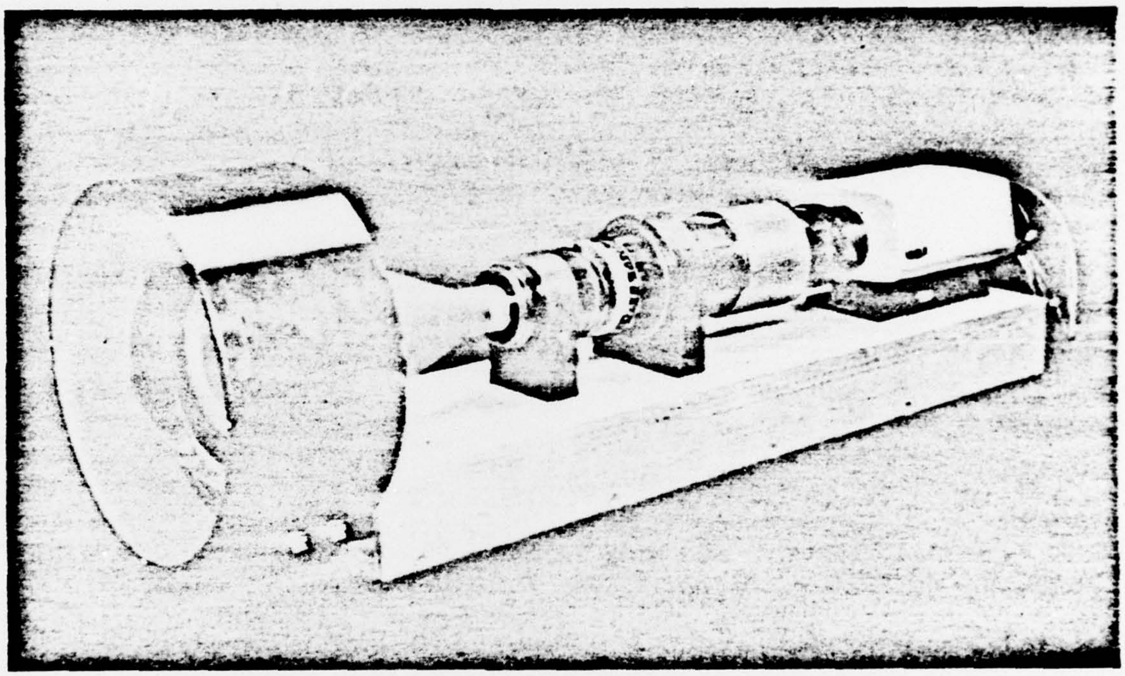


FIGURE 2
FINAL ASSEMBLY

The system was then demonstrated to Naval Surface Weapons Center (NSWC) personnel who hand carried it to NSWC. Subsequently, the equipment was installed by the customer in the electro-optical simulation system of the Advanced Simulation Center at Redstone Arsenal, Huntsville, Alabama. A photo of the simulator with the Non-Linear Lens installed is shown in Figure 3.

After the simulator tests, the equipment was returned to NSWC where it was used for static tests. Upon completion of this effort the equipment was returned to MCAIR for use on related effort.

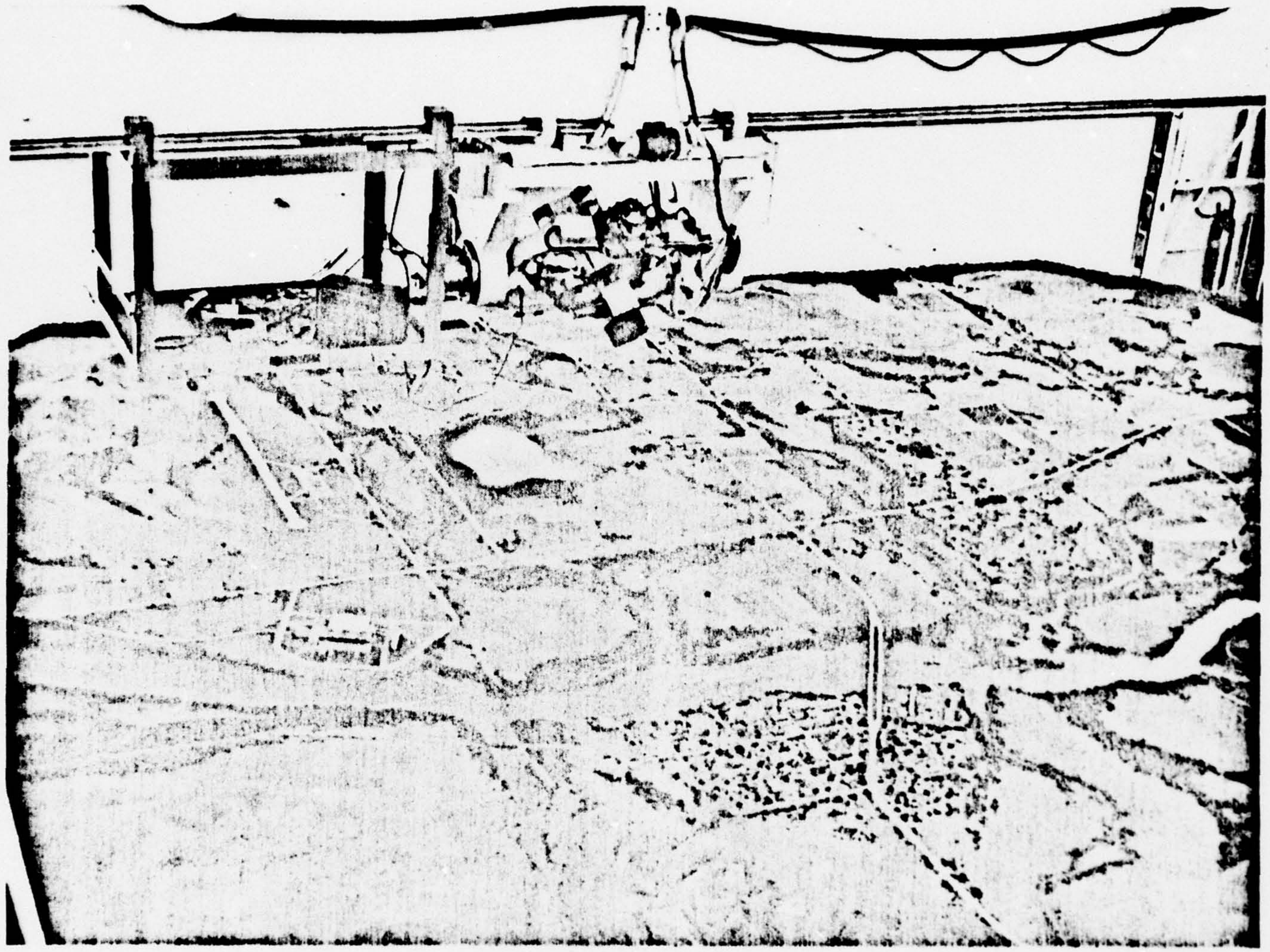


FIGURE 3
U.S. ARMY SIMULATOR